

Original Article

## The Mediating Role of Metacognition in the Relationship between Internet Addiction and General Health

**Fatemeh Bidi MA<sup>1</sup>, Mahdi Namdari-Pejman MA<sup>2</sup>,  
Hossein Kareshki PhD<sup>3</sup>, Hadi Ahmadnia MA<sup>4</sup>**

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### Abstract

**Background:** Internet addiction is one of the harmful effects of the Internet. The findings of several studies have indicated a relationship between general health and Internet addiction. Metacognition, which includes the knowledge, processes, and strategies to evaluate, and monitor or control the cognition, can play a significant role in this regard. The present research aimed to assess the mediating role of metacognitive variables in the relationship between Internet addiction and general health.

**Methods:** This correlational study included 94 male and female users with different nationalities at Internet cafés in Abu Dhabi (the United Arab Emirates). All subjects aged at least 18 years and were proficient in English. The research tools included the General Health Questionnaire (with a reliability of 0.89), Metacognition Questionnaire (with a reliability of 0.82), and Kimberly Young's Internet Addiction Test (with a reliability of 0.88). The hypothesis was tested applying SPSS<sub>18</sub> and Amos<sub>18</sub>.

**Findings:** The results indicated a significant positive relationship between all aspects of metacognition and Internet addiction ( $r = 0.30$ ;  $P < 0.01$ ). A significant positive relationship was also observed between Internet addiction and general health ( $r = 0.47$ ;  $P < 0.01$ ). Path analysis revealed the mediating role of metacognition in the relationship between low general health and Internet addiction. Among the metacognitive variables, the mind control had the highest correlation coefficient ( $r = 0.80$ ).

**Conclusion:** The internet and digital technologies have caused unwanted and negative effects which are classified as emerging damages. The relationship between Internet addiction and general health has been confirmed in this research. In addition, metacognitive processes can have a positive and mediating role on this relationship.

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**Keywords:** Internet, Internet addiction, General health, Metacognition.

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1- Department of Psychology, School of Humanities, Payame Noor University, Dubai, UAE.

2- Department of Educational Sciences, School of Educational and Psychology Sciences, Farhangian University, Hamadan, Iran.

3- Assistant Professor, Department of Psychology and Educational Sciences, School of Psychology and Educational Sciences, Ferdowsi University, Mashhad, Iran.

4- Department of Education, Zanzan Province Education Office, Zanzan, Iran.

Correspondence to: Fatemeh Bidi MA, Email: [bidi.fatemeh@gmail.com](mailto:bidi.fatemeh@gmail.com)

## Introduction

Since growth and development of the Internet are comparable with the 19<sup>th</sup> century industrial revolution, it has been called the Internet revolution.<sup>1</sup> By the ongoing progress of Internet applications, excessive use of the Internet was firstly issued through monograph reports in the press. The reports emphasized on the problems associated with such an excessive use of the Internet and the resulted social, psychological, and professional harms. The performed researches have indicated that depression is more prevalent among the Internet addicts compared to the normal users.<sup>2-5</sup> Moidfar et al. announced that the addicted Internet users felt less responsible toward their society and environment. They were more afflicted by social isolation and job failure. In addition, they enjoyed less social support and lower self-value.<sup>6</sup> In another study, anxiety and depression subscales of general health were more threatened among the Internet addicts compared to normal users. However, physical status and social performance and disorders were not significantly different between the two groups.<sup>7</sup> Alavi et al. reported significant differences in mean psychological symptoms in all general health subscales as well as Global Severity Index (GSI), Positive Symptom Distress Index (PSDI), and Positive Symptom Total (PST) between the two groups of normal and addicted Internet users.<sup>8</sup>

One of the effective parameters on physiological health is the metacognitive beliefs. Metacognition is a multidimensional concept including the knowledge, processes, and strategies which evaluate and monitor or control cognition.<sup>9</sup> Most of the theoreticians have discriminated between the two aspects of metacognition, i.e. metacognitive beliefs and metacognitive monitoring.<sup>10</sup> Metacognitive knowledge, as the information that people have about their cognition, affects their learning strategies. Metacognitive monitoring implies a range of practical applications such as paying attention, controlling, planning, and recognizing performance errors.<sup>11</sup> The ongoing emersion of cognitive theories in mental pathology has caused an interest in cognitive characteristics and their adjustment. Wells and Mathews presented the self-regulatory executive function (S-REF) which was the first theory to conceptualize the role of metacognition in

pathology and continuity of mental disorders. According to S-REF, psychological disorders would last when maladaptive coping strategies such as a feeling of stagnation (anxiety/mental rumination), threat monitoring, and avoidance or thought suppression prevent the adjustment of non-efficient beliefs and increase the access to self-related negative information. In other words, S-REF suggests that mental disorder is derived from a general cognitive attention syndrome which is caused by metacognitive knowledge of the person and would be activated and processed in problematic situations.<sup>12</sup> The S-REF theory develops a descriptive model for special treatment of depression disorder,<sup>13</sup> generalized anxiety disorder,<sup>14</sup> obsession disorder,<sup>12</sup> social anxiety disorder,<sup>15</sup> and posttraumatic stress disorder.<sup>14</sup> Besides, previous research has indicated that metacognitive beliefs are related to depression,<sup>16</sup> psychosis,<sup>17</sup> and obsessive symptoms.<sup>18</sup> A study has reported the best predictive factors of general health to be the individual's scores in metacognitive parameter, uncontrollability, and risk.<sup>19</sup> Spada et al. indicated that metacognitive parameters form a link between negative emotions and harmful use of the Internet.<sup>20</sup> In another research, anxiety and mental problems were identified to be common among individuals who made negative use of the Internet.<sup>5</sup>

Considering the results of previous studies and the widespread use of the Internet in all societies, the ongoing increase in using the Internet seems to affect people's mental and physical health. Internet addiction would thus bring about future negative consequences. Metacognitive factors have been argued to be possibly associated with Internet addiction. Since all variables of this model are partly expected to depend on errors which might be measured with, such tests are generally simulated by structural equations. Therefore, as figure 1 shows, the parameters related with general health are assumed to explain and predict the direct or mediating roles of metacognitive beliefs in Internet addiction.

## Methods

In this correlational study, the relationships between the variables were investigated by structural equation modeling. The statistical population included all male and female users

of the Internet cafés in Abu Dhabi (the United Arab Emirates) who were at least 18 years old and proficient in English. Using offline method, 94 individuals, consisting of 36 females (38%) and 58 males (62%) were selected to participate. People from different nationalities such as Iranian, Indian, Iraqi, Afghan, Pakistani, Syrian, Turkish, Ethiopian, Bangladeshi, Chinese, Spanish, Egyptian, Libyan, Qatari, and British live in Abu Dhabi and participated in this research. Indian and British individuals had the highest (15%) while Spanish and Libyan persons had the lowest (0.5%) frequency in our studied population. The mean age of participants was  $35.4 \pm 6.1$  years.

#### **Data Collection:**

In order to collect data, 3 questionnaires, including Kimberly Young's Internet Addiction Test (IAT), Metacognition Questionnaire (MCQ-30), and Goldberg and Hillier's General Health Questionnaire (GHQ-28), were employed. IAT is a 20-item questionnaire based on Likert scale. The validity of this questionnaire has been confirmed applying diagnostic method.<sup>21</sup> the reliability of this tool has been reported to be 0.90,<sup>22</sup> 0.81,<sup>7</sup> and 0.88<sup>8</sup> in different researches.

MCQ-30 investigates the individual differences in metacognitive beliefs, judgments, and meta-attitudes. It has 5 subscales including positive beliefs about anxiety, negative beliefs about anxiety related to uncontrollability and risk, cognitive trust, the necessity of mind control, and cognitive consciousness. The validity of this questionnaire has been confirmed through calculation of the correlation of its scores by other tools. Wells and Cartwright obtained its reliability as 0.93.<sup>23</sup>

GHQ-28 has 28 items arranged in 4 subscales of physical symptoms, anxiety and insomnia, improper social performance, and depression. Scores higher than 6 in each scale and an overall score of greater than 22 indicate an disease symptoms. The validity of this tool has been confirmed and its reliability has been reported to be 0.84.<sup>24</sup>

#### **Methods:**

At first, in order to consider ethical issues, the aims of the study were described for the participants. They were also ensured about the confidentiality of the collected data to remove the threatening parameters for the validity of

the tool. Afterwards, the participants were invited to fill out the questionnaires in a silent room to minimize physical distraction. They were allowed to ask the researcher about possible ambiguous questions. Besides, the participants were appreciated by offering free access to the Internet depending on the time they devoted to the research aims. Better performance was also guaranteed by offering a sum of money to the manager of the café.

The collected data was finally analyzed by SPSS Amos<sup>18</sup>.

## **Results**

Table 1 illustrates the mean, standard deviation (SD), correlations, and internal consistency of research variables. The variables had strong internal correlations since the lowest and highest correlation coefficients were 0.19 and 0.55, respectively.

After the scoring of the applied scales, negative or inconsistent items were re-encoded and the average score of each scale was calculated. It is worth mentioning that higher scores of general health indicate lower health. Therefore, the obtained average scores were  $62.2 \pm 14.11$  for Internet addiction,  $31.8 \pm 11.83$  for general health, and  $69.50 \pm 14.2$  for metacognition. The reliability of the applied tools was obtained through Cronbach's alpha which was 0.88, 0.89, and 0.82 for the abovementioned parameters, respectively.

Due to the delicate nature of structural equations model and in order to consider its fundamental assumptions, the theory of Baron and Kenny<sup>25</sup> was applied to codify the research assumptions. According to this theory, 3 conditions are required in order to test the effects of a mediating variable. First, both independent and mediating variables should be significantly correlated with the dependant variable. Second, the independent variable should be significantly related with the assumed mediating variable. Third, the relationship between independent and dependant variables should decrease or become non-significant as the mediating variable is being analyzed. According to the information in table 1, general health and Internet addiction were correlated ( $r = 0.47$ ;  $P < 0.01$ ). The multicollinearity assumption and the error independence were also tested and the results indicated that they had been regarded. Since higher scores of general health indicate higher

mental disorders, increased Internet addiction was found to reduce general health. The techniques used in order to test the non-experimental causal relationship between general health and Internet addiction should be based on causal relationships. One of these techniques is path analysis which can be applied to analyze the achieved data through experimental, non-experimental and correlation studies.

In order to investigate the second assumption, Pearson's correlation coefficient was used. According to table 1, metacognition and Internet addiction were correlated ( $r = 0.30$ ;  $P < 0.01$ ). Therefore, the second assumption is also confirmed and the first condition is realized.

Pearson's correlation coefficient was also used to assess the third assumption. As table 1 shows, there was a positive significant relationship between metacognition and general health ( $r = 0.35$ ;  $P < 0.01$ ). In other words, higher scores of general metacognitive beliefs were found to be associated with higher scores of general health, i.e. worse general health status.

Our 3 assumptions could act as the required conditions for the structural equations modeling which was performed through Amos software (Figure 2). Figure 2 depicts 5 components which form the metacognition structure. These components include cognitive

consciousness, cognitive trust, thought control, and negative and positive beliefs about anxiety. The path coefficients were equal to beta ( $\beta$ ) values in multivariate regression. All path coefficients were significant at  $P < 0.05$ . One of the most important assumptions in structural equations modeling is the normality of endogenous variables. In order to evaluate this assumption, general health, metacognition, and Internet addiction variables were tested applying Shapiro-Wilks test. Considering the  $P$  values for the three mentioned variables (0.77, 0.18, and 0.19, respectively), the normality condition was confirmed.

The general indexes of goodness of fitness in structural equations modeling indicated the low fit of the suggested model ( $\chi^2 = 32.62$ ;  $df = 13$ ;  $P < 0.02$ ; residue mean square error approximation = 0.12; comparative fit index = 0.75).

According to table 2, all direct path coefficients were significant ( $P < 0.05$ ). The only indirect coefficient related to general health and Internet addiction was calculated as 0.06 which was not significant ( $P > 0.05$ ). All of the general effects were significant as well ( $P < 0.05$ ). The squared multiple correlation coefficient was obtained as 0.31 which indicates an average explanation of general health by Internet addiction and metacognitive beliefs. Therefore,

Table 1. Descriptive statistics, alpha, and internal correlations between variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Positive beliefs about anxiety (1)	1.00	-	-	-	-	-	-
Negative beliefs about anxiety (2)	0.31**	1.00	-	-	-	-	-
Cognitive trust (3)	0.35**	0.11	1.00	-	-	-	-
The need to mind control (4)	0.35**	0.55**	0.30**	1.00	-	-	-
Cognitive consciousness (5)	0.07	0.26**	-0.01	0.23**	1.00	-	-
General health (6)	0.19*	0.11	0.51**	0.39**	-0.04	1.00	-
Internet addiction (7)	0.26**	0.04	0.40**	0.25**	-0.11	0.47**	1.00
Mean	13.40	13.80	13.40	13.80	15.09	31.80	62.20
Standard deviation	2.69	3.23	2.91	2.73	2.62	11.83	14.11
Alpha	0.78	0.75	0.83	0.63	0.53	0.89	0.88

\*  $P < 0.05$ ; \*\*  $P < 0.01$

Table 2. The estimation of direct, indirect, and general effects of variables based on values of the regression beta

Paths	Direct coefficient	Indirect coefficients	General effect
Internet addiction to metacognition	0.314	0	0.314
Internet addiction to general health	0.371	0.088	0.460
Metacognition to general health	0.282	0	0.282

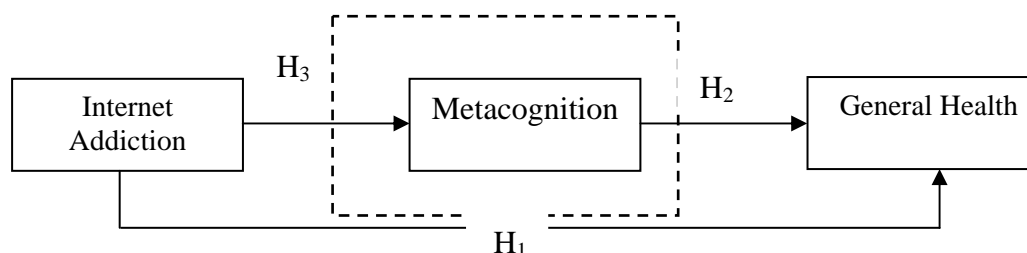


Figure 1. The model of the relationship between Internet addiction, metacognitive beliefs, and general health

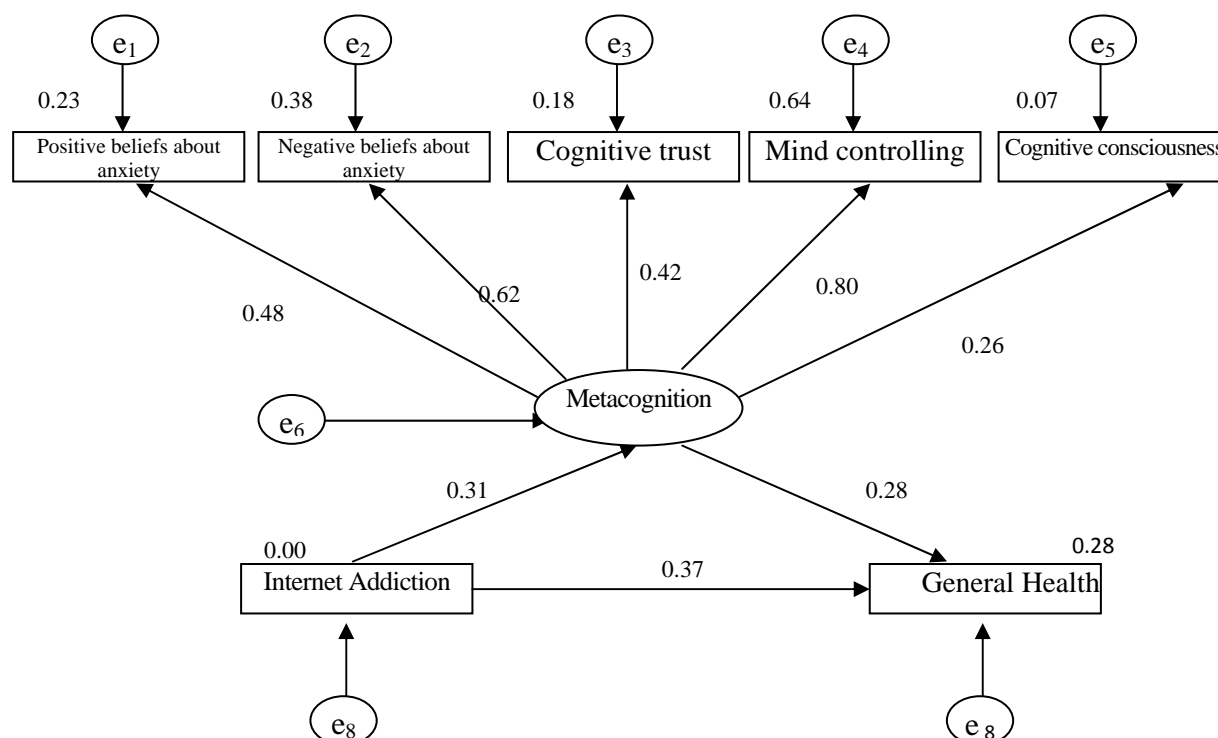


Figure 2. Testing the model of the mediating role of metacognition in the relationship between Internet addiction and general health, E stands for Error.

while about 31% of variance in general health can be explained through this model, the rest depend on other factors.

## Discussion

This research aimed to investigate the mediating role of metacognition in the relationship between Internet addiction and general health. The results indicated that a significant relationship between the variables.

The research findings showed a relationship between Internet addiction and general health. Considering the reversed scoring of general health, it can be said that as the individual's addiction to Internet increases, his general health would decrease. The findings of the first assumption are in accordance with the findings of Nastizai,<sup>7</sup> Alavi et al.,<sup>8</sup> Kim et al.,<sup>22</sup> and Kraut

et al.<sup>26</sup> Considering the changes Internet addiction causes in a person's life, such as making difference in lifestyle in order to spend more time on the Internet, a general decrease in physical activity, neglecting the health status as a result of Internet abuse, avoiding significant activities of life in order to have more time for Internet application, reduced social relationships, and neglecting the family and friends,<sup>27</sup> it seems that Internet addiction is related to depression.

Our findings also showed that the relationship between metacognition and Internet addiction was significant. Several other studies have reported a similar association.<sup>14,16,20</sup> Davis model can be applied in order to explain this finding.<sup>28</sup> Based on this model, metacognition plays a significant role in

preparing individuals to improve their reaction models toward internal thoughts and events. This role can affect excessive self-oriented attention, cyclic thought patterns, avoidance and repression of thoughts, and abnormal behaviors which might in turn be related with Internet addiction.<sup>14</sup> A research investigated the relationship between Internet addiction and psychological malfeasance and indicated anxiety and mental problems to be common among those who used the Internet in a negative way.<sup>22</sup>

The results of testing the third assumption showed a positive correlation between general health and metacognition. In other words, increases in mental pathology were associated with metacognitive beliefs. Ashouri et al.,<sup>19</sup> Wells and Papageorgiou,<sup>29</sup> and Matthews et al.<sup>30</sup> reported similar findings. Such findings can be justified by considering the relation between metacognitive beliefs and mental health. Therefore, since changes in metacognition increase the negative discordant thoughts, general negative beliefs would also increase. The fundamental hypothesis in self-regulatory theory is that metacognition plays a significant role in choosing and continuing inefficient contrastive strategies whose use leads to the formation and continuity of mental disorders. In addition, the belief in uncontrollability and risk is related with the individual's beliefs about uncontrollable thoughts and the fact that these thoughts should be controlled in order to express fine performance and enjoy health. Therefore, the existence of such metacognitive belief makes people feel to have less personal control and experience increased anxiety and depression. On the other hand, the metacognitive belief of uncontrollability and risk makes individuals to doubt their abilities and qualifications and thus reduces their mental health. The experience of emotional tension in persons with high scores of uncontrollability and risk involves them in using maladaptive coping strategies which would in turn cause the concepts of threatening in process more accessible and stress and

negative excitement more intensified. In fact, these processes lead the person to overestimate environmental risks and underestimate his coping ability and thus experience a long lasting mental disorder. Based on regression coefficients of the predicting variables, among the 5 parameters of metacognition, mental control can best predict general health. The findings of Spada et al.,<sup>18</sup> Ashouri et al.,<sup>19</sup> and Bahrami and Rezvan<sup>31</sup> and the assumptions of S-REF theory<sup>12</sup> were in accordance with our results.

Since the prevention is always preferable to treatment, and considering the results of this study, Internet addiction should be certainly treated as a mental problem which often involves the youth and proactive generation of the society. Therefore, appropriate education would replace the wrong methods of using the Internet with a good culture of using computers, the Internet, and related facilities. Thus it is necessary to identify and investigate the models of using electronic tools to be aware of their effects on our lives along with increasing our knowledge. The status of Internet addiction and its different types such as addiction to online chats, games, data collection, stock exchange, gambling, cyber-sex, pornography, romantic relationship, and sexual abuse among Iranian university and school students is suggested for the future researches. Psychiatrists and psychologists who are active in the field of mental hygiene must be aware of mental problems associated with Internet addiction such as depression, anxiety, obsession, hypochondria, paranoia, interpersonal sensitivity, and job and educational dissatisfaction among Internet addicts. Due to their clinical application, these findings indicate that individuals can be trained to change their metacognitive beliefs and enjoy more general and mental health as a result.

**Conflict of Interest:** The Authors have no conflict of interest.

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## تبیین نقش میانجی گرانه فراشناخت در رابطه بین اعتیاد به اینترنت و سلامت عمومی

فاطمه بیدی<sup>۱</sup>، مهدی نامداری پژمان<sup>۲</sup>، دکتر حسین کارشکی<sup>۳</sup>، هادی احمدنیا<sup>۴</sup>

## چکیده

**مقدمه:** یکی از موارد زیان آور فن آوری اینترنت، اعتیاد به آن می باشد. یافته های چندین پژوهش حاکی از رابطه بین سلامت عمومی با اعتیاد به اینترنت است. در این رابطه، فراشناخت می تواند نقش مهمی داشته باشد. فراشناخت در برگیرنده دانش، فرایندها و راهبردهایی است که شناخت را ارزیابی، نظارت و یا کنترل می کند. پژوهش حاضر با هدف، بررسی نقش میانجی گرانه متغیرهای فراشناختی در رابطه بین اعتیاد به اینترنت و سلامت عمومی صورت گرفت.

**روش ها:** این پژوهش با روش همبستگی بر روی ۹۴ نفر از کاربران زن و مرد کافی نت های ابوظبی که از ملیت های مختلف، دارای حداقل سن ۱۸ سال و مسلط به زبان انگلیسی بودند، انجام شد. ابزارهای پژوهش شامل پرسش نامه سلامت عمومی Goldberg (با پایایی ۰/۸۹)، پرسش نامه فراشناخت Wells and Cartwright (با پایایی ۰/۸۲) و پرسش نامه اعتیاد به اینترنت Kimberly Young (با پایایی ۰/۸۸) بود. فرضیه ها با استفاده از نرم افزارهای SPSS<sup>۱۸</sup> و AMOS<sup>۱۸</sup> آزمون شدند.

**یافته ها:** رابطه مثبت و معنی داری بین تمامی ابعاد فراشناخت و اعتیاد به اینترنت وجود داشت ( $r = 0.30$  و  $P < 0.01$ ). همچنین رابطه مثبت و معنی داری بین اعتیاد به اینترنت و سلامت عمومی مشاهده گردید ( $r = 0.47$  و  $P < 0.01$ ). نتایج حاصل از اجرای تحلیل مسیر نشان داد، فراشناخت رابطه بین سلامت عمومی پایین و اعتیاد به اینترنت را میانجی گری کرده و مقدار رابطه آن ها را تحت تأثیر قرار می دهد. در بین متغیرهای فراشناختی، کنترل افکار بیشترین ضریب همبستگی را داشت ( $r = 0.80$ ).

**نتیجه گیری:** اینترنت و فن آوری های دیجیتالی، دارای تأثیرات منفی و ناخواسته ای هستند که در رده آسیب های نوپدید به شمار می آیند. ارتباط بین اعتیاد به اینترنت و سلامت عمومی در این پژوهش تأیید شد. فرایندهای فراشناختی می تواند در این ارتباط نقشی مثبت و بازدارنده داشته باشد.

واژگان کلیدی: اینترنت، اعتیاد به اینترنت، سلامت عمومی، فراشناخت.

مجله اعتیاد و سلامت، سال چهارم، شماره ۲-۱، زمستان و بهار ۹۱-۱۳۹۰

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